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APPLICATION NO	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO
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EXAMINER
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ART UNIT	PAPER NUMBER
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DATE MAILED:

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

# Office Action Summary

Application No.

09/761,240

Applicant(s)

BAUER ET AL

Examiner

Johannes P Mondt

Art Unit

2826

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE \_\_\_\_ MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 16 April 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-3 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-3 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_ is/are objected to.
- 8) ☐ Claims \_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_ is/are objected to by the Examiner.
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. § 119

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☒ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

## Attachment(s)

- 15) ☒ Notice of References Cited (PTO-892)
- 16) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 17) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_
- 18) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_
- 19) ☐ Notice of Informal Patent Application (PTO-152)
- 20) ☐ Other

**DETAILED ACTION**

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5528058 to Pike, Jr. Et al in view of U.S. Patent No. 5357130 to Scholz et al and U.S. Patent No. 4881979 to Lewis.

Pike Jr. et al show (front page figure) a silicon based device with an emitter, a  $N^+$  stop zone in front of the emitter, while the  $N^+$  stop zone has been doped with phosphorus (e.g. page 18, line 51), a foreign atom in the silicon substrate. Hence, Pike Jr. et al is an example of the prior art mentioned, albeit not listed, in the present invention (page 6) Phosphorus has an ionization energy of about 45 meV, i.e., well within the band gap of the semiconductor (1.1 eV); however, for the purpose of this invention, i.e., to provide a stop zone active only during the OFF state, the ionization energy is small, falling short of the final limitation in claim 1 ( $> 200$  meV away not only from the conduction band, but also from the valence band). Therefore, Pike Jr. et al only is prior art of the type mentioned, albeit not referred to, by the inventors. However, Scholz teaches the use of tellurium as a n-type dopant because its ionization energy of about 140 meV is

higher than that of "conventional dopants" such as "arsenic, phosphorus" in order to avoid high levels of deionization. Therefore, the use of dopants with a high ionization energy relative to conventional dopants to enable full ionization was known at the time of the invention. In addition, the values of the ionization energies of sulfur and selenium were also known at the time of the invention, while both selenium and sulfur have long been recognized as suitable dopants in semiconductors, as exemplified by Lewis (page 14, line 21). Therefore, it would have been obvious to one of ordinary skills in the art at the time the invention was made to modify the device so as to include the use of either sulfur (claim 2) or selenium (claim 3) as foreign atoms in the stop zone, each VI-group element having ionization energies more than 200 meV apart from both conduction and valence bands in silicon (claim 1).

### ***Conclusion***

2. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Johannes P Mondt whose telephone number is (703) 306-0531. The examiner can normally be reached on 8:00 am - 5:30 pm.
3. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan J Flynn can be reached on (703) 308-6601. The fax phone numbers for the organization where this application or

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proceeding is assigned are (703) 308-7722 for regular communications  
and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application  
or proceeding should be directed to the receptionist whose telephone  
number is (703) 308-0956.

JPM

June 10, 2001

~~Not a~~  
~~For~~